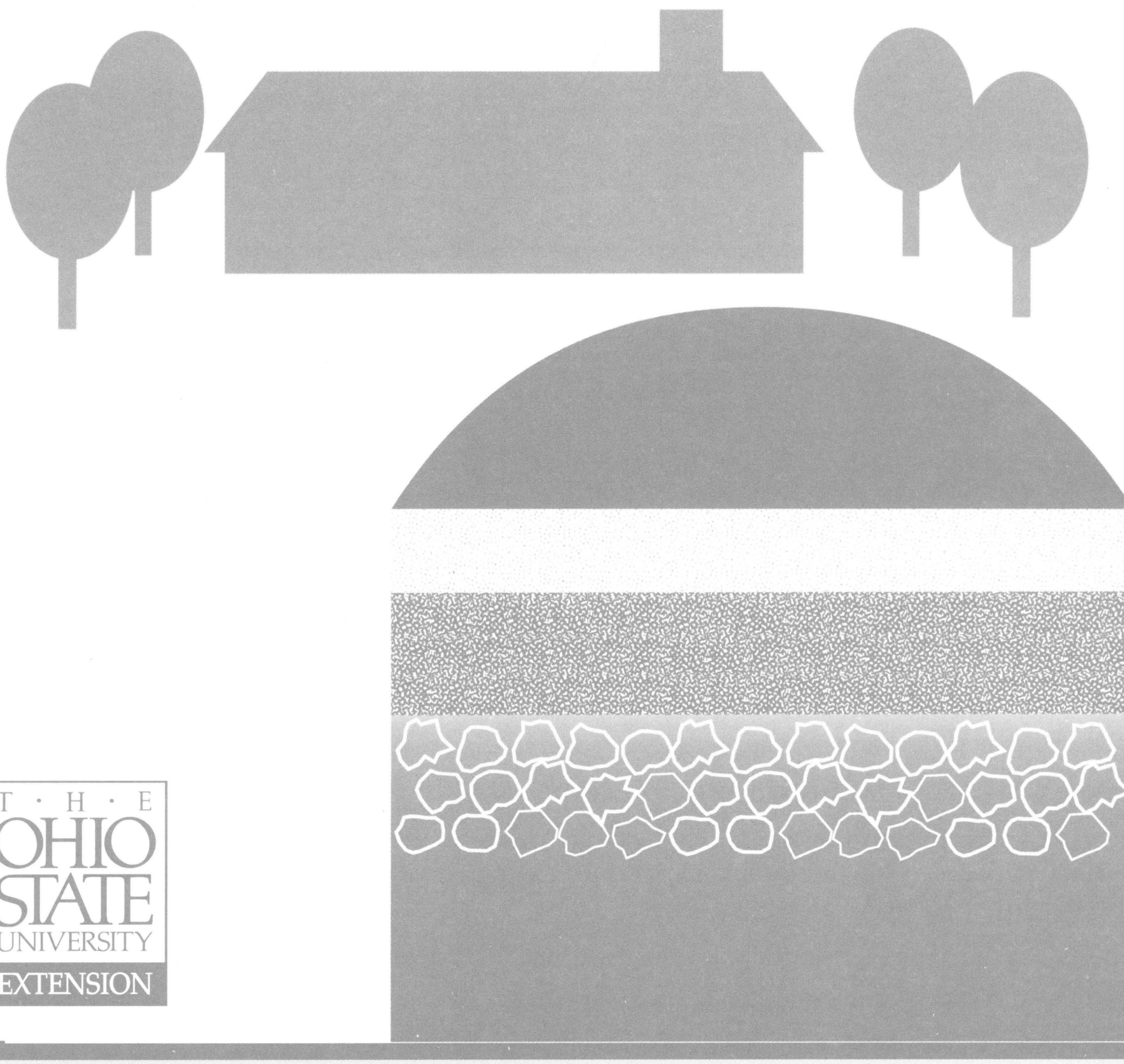
Bulletin 813

Mound Systems for Onsite Wastewater Treatment

Siting, Design, and Construction in Ohio



THE OHIO STATE UNIVERSITY EXTENSION

Mound Systems for Onsite Wastewater Treatment

Siting, Design, and Construction in Ohio

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Mound Systems for Onsite Wastewater Treatment

Protecting public health and water quality is the goal of an onsite wastewater treatment system. Many treatment technologies are available to meet this goal. The selection of an appropriate technology is dictated by site and soil conditions. Mound systems are one type of onsite treatment technology.

Conventional septic tank-absorption field systems may not be suitable for onsite wastewater treatment based on the site conditions and soil characteristics. Current Ohio regulations require a minimum of 4 feet of unsaturated and permeable soil for onsite wastewater treatment and disposal. Based on data from county soil surveys, only 6.4% of Ohio land area presents suitable soil characteristics for conventional systems. Mound systems can be used to overcome the natural limitations for sites that do not meet the requirements and to achieve the goals of protecting water quality and public health. Figure 1 demonstrates the cross section of conventional soil absorption and the mound system in relation to ground surface and limiting conditions.

Many mound systems have been installed and are operating in Ohio. The Household Sewage Rules (Chapter 3701-29, Ohio Administrative Code) contain no specific guidance for mound systems. This bulletin describes the procedures for siting, design, construction, management, and maintenance of mound systems. The goal of appropriate mound systems is to protect the water quality and public health in Ohio when applying for variance with the local health department or a permit to install from the Ohio Environmental Protection Agency.

In conjunction with this bulletin, two other bulletins should also be used to achieve a sound mound system. One bulletin is Suitability of Ohio Soils for Treating Wastewater (Bulletin 896), and the other is Mound Systems: Pressure Distribution of Wastewater—Design and Construction in Ohio (Bulletin 829).

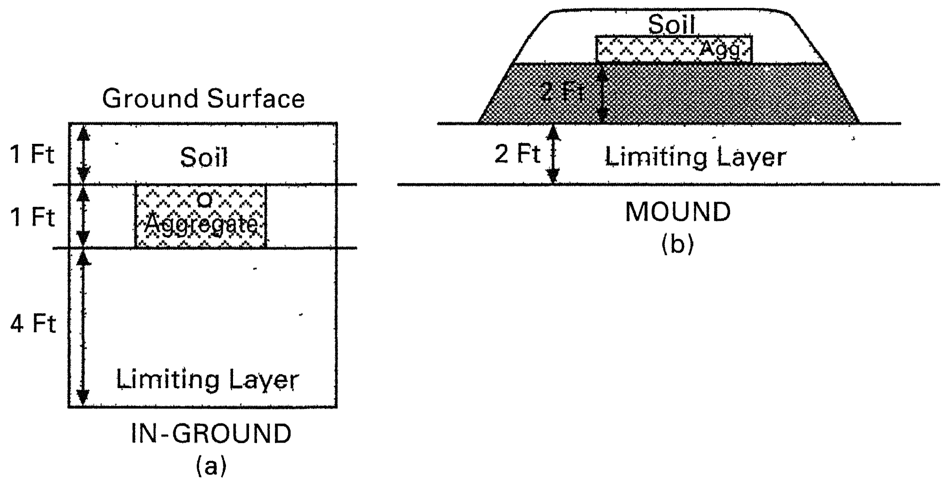


Figure 1. Cross section of conventional soil absorption unit (a) and the mound system (b) in relation to ground surface and limiting conditions. (After Converse and Tyler, 1990, Wisconsin Mound Soil Absorption System: Siting, Design and Construction Manual, University of Wisconsin-Madison.)

Where Should Mound Systems Be Used in Ohio?

Mound systems can be used in areas of Ohio with seasonal high water tables, shallow depths to a restrictive soil layer or bedrock. A minimum depth of 24 inches of unsaturated and permeable soil is a prerequisite for a mound system design using this bulletin and Bulletin 829. The permeability of the soil must be at least 0.5 inch per hour and no more than 20 inches per hour.

A mound system must be positioned in the landscape along the contour of the lot. Separation distances of 50 feet from drinking wells and of 10 feet from property lines are required for the mound system, as shown in Figure 2. Mounds are long and narrow to insure that wastewater can infiltrate the soil beneath and move away from the mound without surfacing. Ideally the mound should be as long and narrow as possible along the contour, but no shorter than is prescribed for the design linear loading rate. Constructing a mound shorter and wider than recommended will result in surfacing of partially treated wastewater.

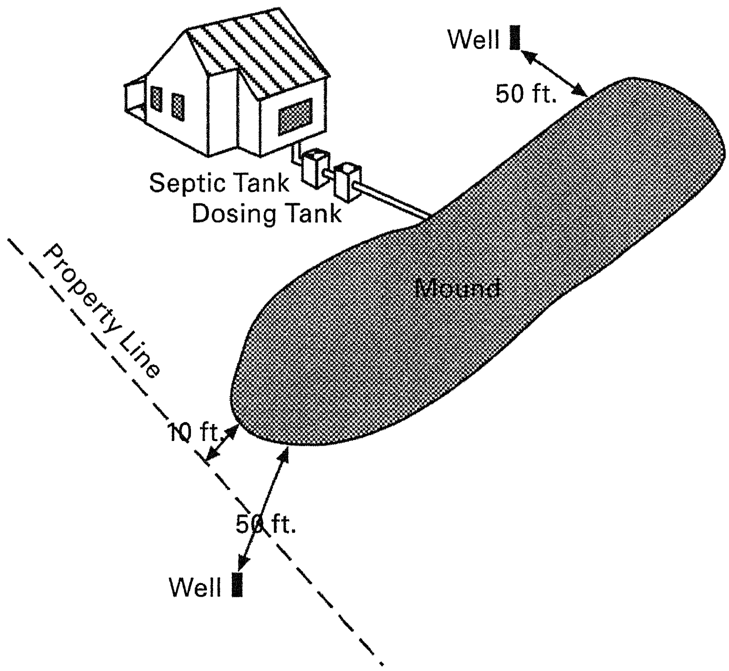


Figure 2. Separation distances for the mound system.

How Are Mound Systems Supposed to Work?

Conventional septic tank-absorption field systems rely on suitable soil and site conditions to treat wastewater onsite. Mound systems are only slightly different in principle from a wastewater treatment aspect. Mound systems are elevated absorption beds and utilize suitable sand fills to partially treat wastewater before it reaches natural soil. Mound systems are used to augment natural soil for complete treatment and disposal.

A mound system consists of a septic tank, a dosing tank, distribution pipes, and a mound, as shown in Figure 3. The septic tank allows the solids in wastewater to settle and degrade. The septic tank effluent is filtered by an effluent filter and discharged to a dosing tank. The dosing tank is equipped with a pump to deliver the septic tank effluent through the distribution system to the mound. The distribution system normally consists of small diameter pipes and allows for even wastewater application under low pressure on the mound.

Most of the wastewater pollutants are removed as the wastewater flows through the sand layer in the mound. The natural soil underneath absorbs the partially treated wastewater from the mound and removes pathogens to complete treatment and disposal.

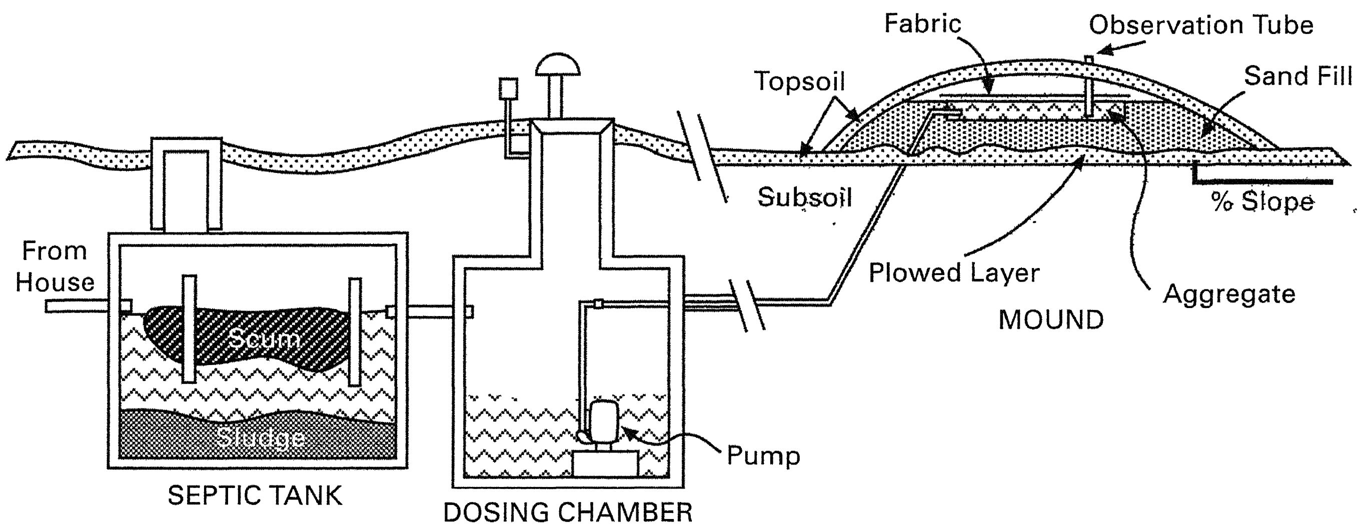


Figure 3. Schematic of the Mound System (After Converse and Tyler, 1990).

How Are Mound Systems Designed?

Designing the mound component is described here in a 15-step process. The wastewater distribution design steps are described in Bulletin 829, Mound Systems: Pressure Distribution of Wastewater. The configuration of the mound is based on the volume of the wastewater to be treated, the characteristics of the natural soil, and the depth to the limiting condition.

The following pages describe the design processes and work through an example of a system for a three-bedroom home.

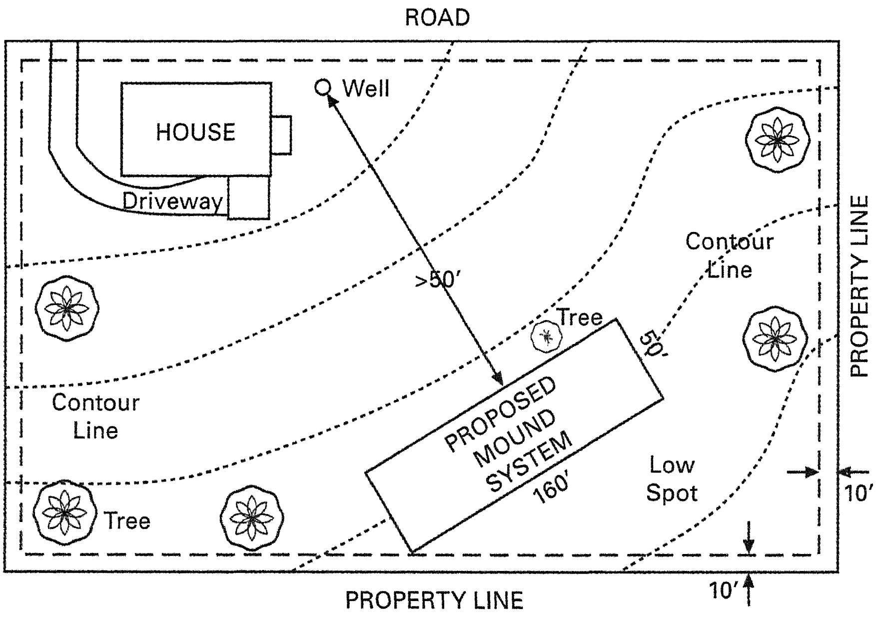
Mound System Design Example

Step 1. Evaluate Site Location for Mound System.

A mound system is proposed for treatment and disposal of domestic wastewater for a three-bedroom residence. On a site that meets the recommended soil and site criteria, establish the contour of the lot and mound area. Stake out the mound so that the absorption bed runs parallel to the contour. Mounds must be on the contour to maintain constant mound height and to ensure even distribution of effluent. Mound systems should be installed 50 feet or more from existing wells and more than 10 feet from the property line. Paint lines between stakes in case stakes are disturbed.

A summary of the soil and site information is given below. Confirm the described soil and site description prior to designing a mound system for the site.

1. *Soil Profile (summary of three soil excavations based on shallowest values):*
   a. *0-10 inches:* *silt loam texture; strong, moderate, angular blocky structure; friable consistence*
   b. *10-26 inches:* *sandy clay loam texture; moderate structure; friable consistence*
   c. *26-36 inches:* *clay loam texture; moderate, fine platy structure; firm consistence*
   d. *Below 36 inches:* *shale bedrock*
2. *Site slope is 12%.*
3. *The area available is 160 feet along the contour and 50 feet along the slope. Three medium-sized trees are in the mound area.*
4. *Depth to limiting condition is 26 inches due to fine platy structure creating a restrictive layer.*



Step 2. Determine Design Wastewater Loading Rate.

The design daily wastewater volume, based on the Ohio Household Sewage Rules (OAC 3701-29), is 120 gallons/bedroom/day.

Newly constructed mound system to serve 3-bedroom house.

Design Wastewater Loading Rate:
For a three-bedroom residence, design wastewater loading rate is
120 gallons/day/bedroom x 3 bedrooms = 360 gallons/day (gpd)

Step 3. Select Linear Loading Rate.

Selection of the linear loading rate is a very important step in designing a mound system. The linear loading rate determines the length of the mound along the contour and controls the landscape hydraulic loading. Based on the soil and site evaluation conducted by a qualified professional and in accordance with Bulletin 905, Soil and Site Evaluation for Onsite Wastewater Treatment, identify the nature of the limiting condition. Using Table 1, select the corresponding linear loading rate. The space-limited value is a less conservative value and should be used only if limited suitable area is available.

Table 1. Linear Loading Rates Based on Limiting Conditions

Nature of Limiting Condition	**Linear Loading Rate Range (gpd/linear ft)**		
	Conservative Value		**Space-Limited Value**
Solid bedrock	3	to	4
Impermeable soil layer	3	to	4
Seasonal high water table	3	to	4
Semipermeable soil layer	5	to	6
Fractured compacted till	5	to	6
Creviced or fractured bedrock	8	to	10
Sand and/or gravel layer	8	to	10

Linear Loading Rate:

The soil evaluation revealed a limiting condition as a restrictive soil layer (with fine platy structure above solid bedrock). The corresponding linear loading rate (space-limited value) from Table 1 is 4 gpd/lf.

Step 4. Select the Sand Fill Loading Rate.

The selection of sand fill material is critical to long-term performance of the mound system. The purpose of the sand fill is to accept effluent from the distribution system and partially treat the wastewater before infiltration into the natural soil. A suitable sand is one that can be loaded at a reasonable rate and will provide satisfactory treatment. Generally, the finer the sand the better the treatment and the slower the wastewater infiltration into the absorption bed. Too coarse a sand will allow effluent to pass through the mound with little removal of impurities. Too fine a sand cannot be loaded at an acceptable rate and may cause severe clogging of the sand, which results in failure of the mound system.

Following the USDA Soil Textural Classification, a coarse sand is suitable. However, this is subject to the following two conditions: (1) no more than 20% by weight is gravel (> 2 mm), and (2) no more than 5% by weight is silt and clay (< 0.053 mm). (Note: Request a sieve analysis report on a proposed sand from the aggregate supplier to check these criteria.)

Concrete sand is produced by many sand and gravel quarries in Ohio and generally meets the criteria for the very coarse and very fine fractions. The fine aggregate specified by the Ohio Department of Transportation will meet the mound sand requirements. The specification is detailed in Section 703.02 of Aggregate for Portland Cement Concrete, Office of Construction Administration, 2002 Construction and Material Specifications. Although mason sand is also commonly available, it is a finer sand than concrete sand and is not recommended. Limestone sand is not suited although it may meet size requirements. Limestone sand can dissolve over time, reducing the system's useful life.

Sand specifications are also given in terms of effective size and uniformity coefficient. When using these criteria, select a sand with an effective size in the range of 0.15-0.30 mm, and with a uniformity coefficient in the range of 4-6.

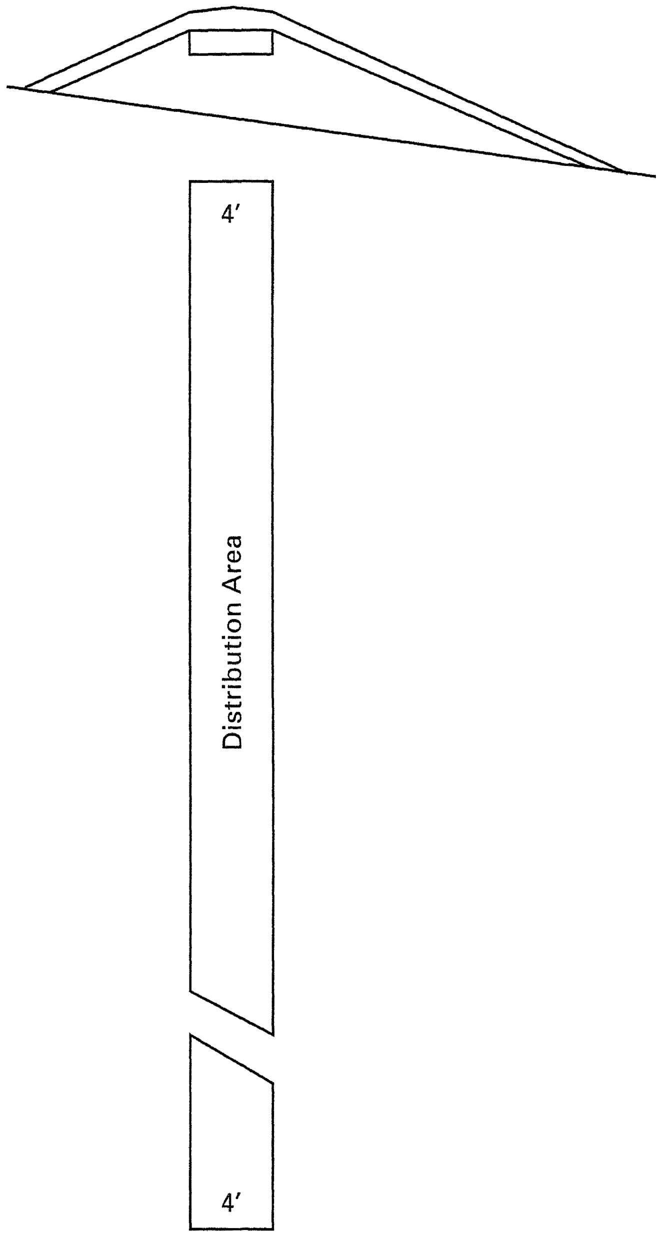
When using a sand that meets the guidelines above, the recommended design sand fill loading rate is 1.0 gpd/ft^2 if the wastewater is typical domestic septic tank effluent. If the effluent is from a commercial establishment, the wastewater quality should be evaluated and the sand fill loading rate should be adjusted accordingly. When treating higher strength wastewater, the sand fill loading rate should be reduced, or there may need to be additional pretreatment to achieve a waste strength comparable to domestic effluent prior to distribution to the sand fill material.

Sand Fill Loading Rate:

Sand Fill Loading Rate = 1.0 gpd/ft^2

Step 5. Determine the Distribution Area Width.

Distribution Area Width = (Linear Loading Rate)/(Sand Fill Loading Rate)

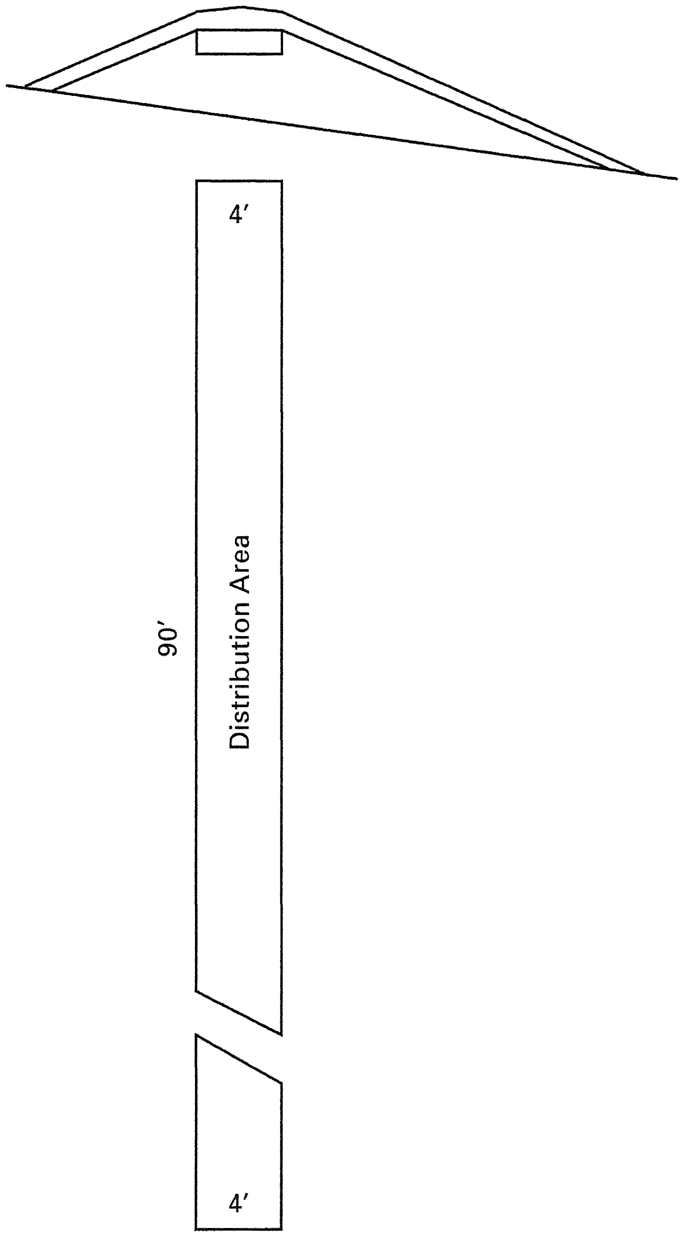


Distribution Area Width:

Distribution Area Width = *(Linear Loading Rate)/(Sand Fill Loading Rate)*
= *(4 gpd/lf)/(1 gpd/ft²)*
= *4 ft*

Step 6. Determine the Distribution Area Length.

Distribution Area Length = (Design Wastewater Loading Rate)/(Linear Loading Rate)



Distribution Area Length:

Distribution Area Length = (Design Wastewater Loading Rate)/(Linear Loading Rate)
= (360 gpd)/(4 gpd/lf)
= 90 ft

Step 7. Select Basal Area Loading Rate.

The wastewater moves down through the sand layer by gravity. When the sand-treated wastewater reaches the sand/soil interface it cannot move as quickly into the soil as the sand above. The wastewater begins to spread out in the downslope direction. The area that the wastewater spreads out on the sand/soil interface is called the basal area. It is necessary to use the basal loading rate to determine the basal area. The nature of the surface soil horizon determines the basal loading rate, as shown in Table 2. If there is a less permeable layer within the 2 feet of soil below the mound, a more conservative basal loading rate may be selected.

Table 2. Estimated Basal Loading Rates (After Converse and Tyler, 1990.)

Surface horizon based on soil morphological conditions	If YES, the basal loading rate is (gpd/ft^2):
A. Is the horizon gravelly coarse sand or coarser?	0.0*
B. Is consistence stronger than firm or hard, or any cemented class?	0.0*
C. Is texture sandy clay, clay or silty clay of high clay content and structure massive or weak, or silt loam and structure massive?	0.0*
D. Is texture sandy clay loam, clay loam or silty clay loam and structure massive?	0.0*
E. Is texture sandy clay, clay or silty clay of low clay content and structure moderate or strong?	0.2
F. Is texture sandy clay loam, clay loam or silty clay loam and structure weak?	0.2
G. Is texture sandy clay loam, clay loam or silty clay loam and structure moderate or strong?	0.4
H. Is texture sandy loam, loam, or silt loam and structure weak?	0.4
I. Is texture sandy loam, loam, or silt loam and structure moderate or strong?	0.6
J. Is texture fine sand, very fine sand, loamy fine sand, or loamy very fine sand?	0.6
K. Is texture coarse sand with single grain structure?	0.8

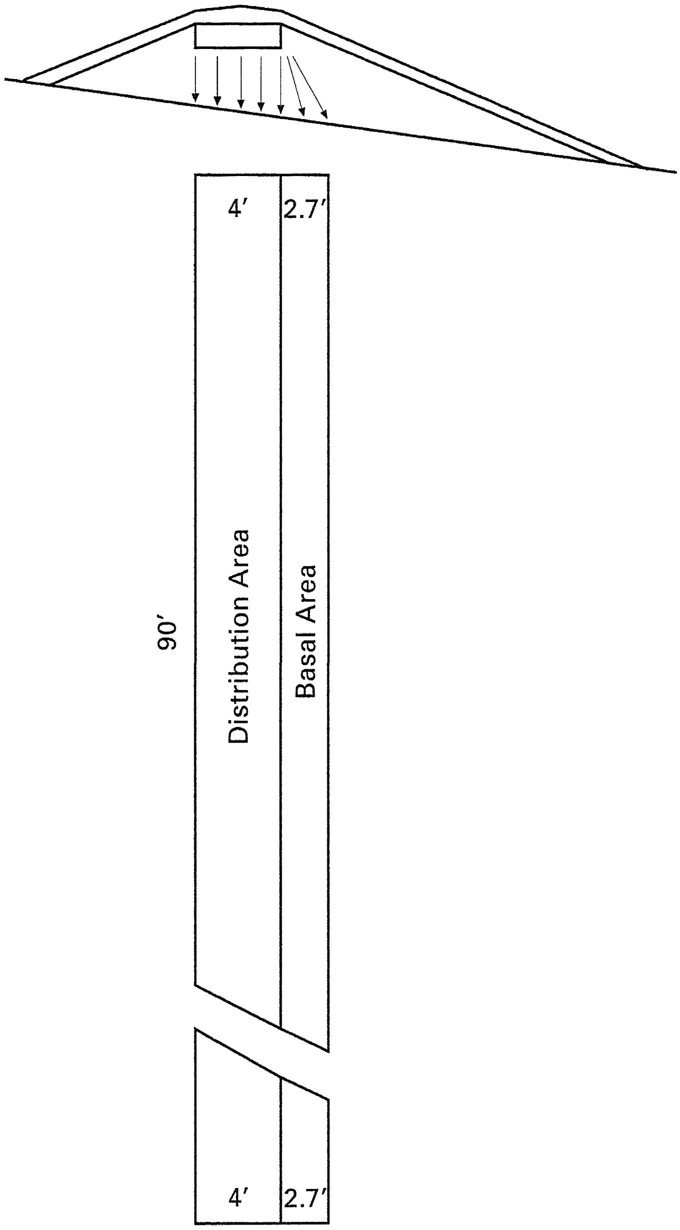
* If the site surface soil horizon condition results in zero basal loading rate, STOP here. The selected site is not suitable for mound system.

Basal Area Loading Rate:

The site soil evaluation revealed that silt loam soil with moderate structure was present in the surface horizon (top 10 inches). Found under item I, the design basal loading rate is 0.6 gpd/ft^2.

Step 8. Determine the Basal Width.

Basal Width = (Linear Loading Rate)/(Basal Loading Rate)
The basal width should be outlined on the site and protected from construction traffic and equipment. (Note: The basal width is normally less than the mound side widths, which are required to provide a mound side slope no steeper than 3:1.)



Basal Width:

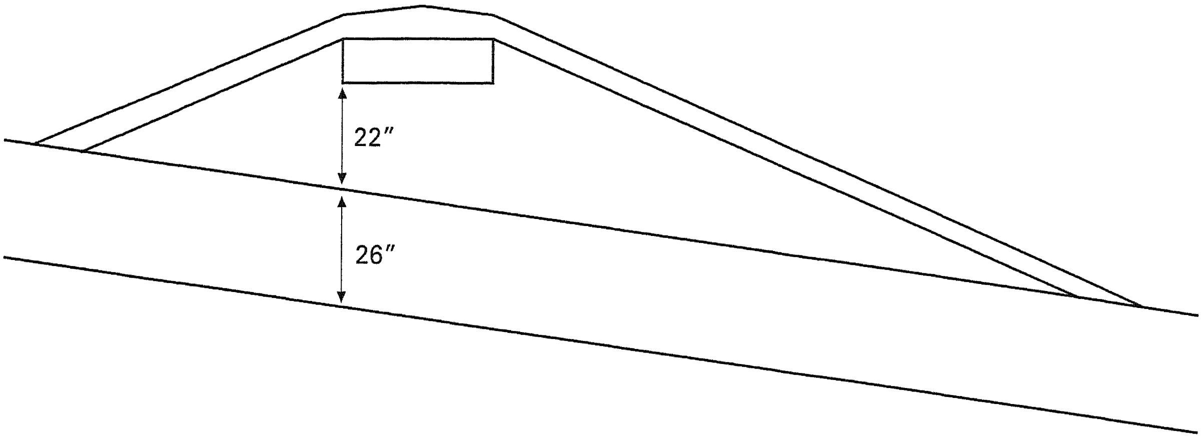
Basal Width $= (\text{Linear Loading Rate})/(\text{Basal Loading Rate})$
$= (4\ gpd/lf)\ /(0.6\ gpd/ft^2)$
$= 6.7\ ft$

The basal width is 6.7 – 4 = 2.7 feet wider than the distribution area width.

Step 9. Determine Mound Sand Fill Upslope Depth.

The Ohio Household Sewage Rules require 4 feet of suitable soil for soil absorption systems. In this design ex ample, the silt loam and sandy clay loam layers are considered suitable. The clay loam soil is not suitable due to its fine platy structure. The soil profile indicates 26 inches of suitable soil. The mound sand fill combined with the existing suitable soil must be at least 4 feet.

Mound Sand Fill Upslope Depth = (48 inches) – (Depth of Suitable Soil to Limiting Condition)



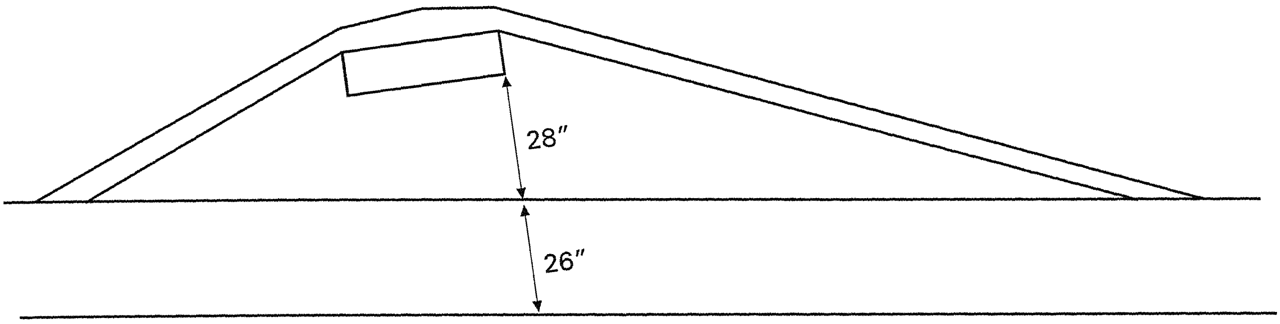
Mound Sand Fill Upslope Depth:

Mound Sand Fill Upslope Depth	*= (48 inches) – (Depth of Suitable Soil to Limiting Condition)*
	= (48 inches) – (26 inches)
	= 22 inches

ep 10. Determine Mound Sand Fill Downslope Depth.

ne bottom of the distribution area must be constructed level. Therefore, the sand fill will be deeper on the ownslope side of the distribution area.

Mound Sand Fill Downslope Depth = (Mound Sand Fill Upslope Depth) + (Site Slope)*(Distribution Width)



Mound Sand Fill Downslope Depth:

The site slope is 12% in this design example.

Mound Sand Fill Downslope Depth

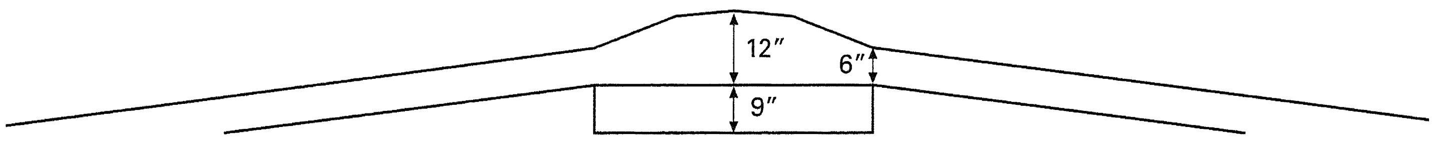
= (Mound Sand Fill Upslope Depth) + (Site Slope)(Distribution Width)*
= (22 inches) + (0.12)(48 inches)*
= 28 inches

Step 11. Distribution Area Aggregate Depth, Cover Depth, and Mound Cap Depth.

Clean washed coarse aggregate should be provided to protect the distribution system. A minimum depth of 6 inches of coarse aggregate base is beneath the distribution laterals, 2 inches aggregate depth for pipe depth, and 1 inch of aggregate above distribution laterals as cover. The total aggregate depth should be 9 inches.

A distribution system cover of a 12-inch soil crown will help drain water from the top of the mound. The extra depth also provides additional frost protection.

To ensure proper mound system performance, 6 inches of soil cover is required for the mound side slope cap providing frost and erosion protection. Soil cap can be one of the expensive features among the construction materials. The preferred materials for the soil cap are sand loam, loamy sand, and silt loams. The soil must be adequate to support grass growth to prevent soil erosion. Clay subsoil may be amended with 1/3 compost peat or manure and 1/3 coarse sand to create a 6-12 inch cap suitable for grass growth. Do not compact the mound soil cap because the microbial community treating wastewater in the mound and the grass growing on the mound need air. Natural settling of the soil cover and cap will occur over time.



Aggregate Depth in Distribution Area = *9 inches (6 inches of aggregate base, 2 inches for pipe depth, and 1 inch aggregate above distribution system)*

Distribution System Cover Depth = *12 inches*

Mound Cap Depth = *6 inches*

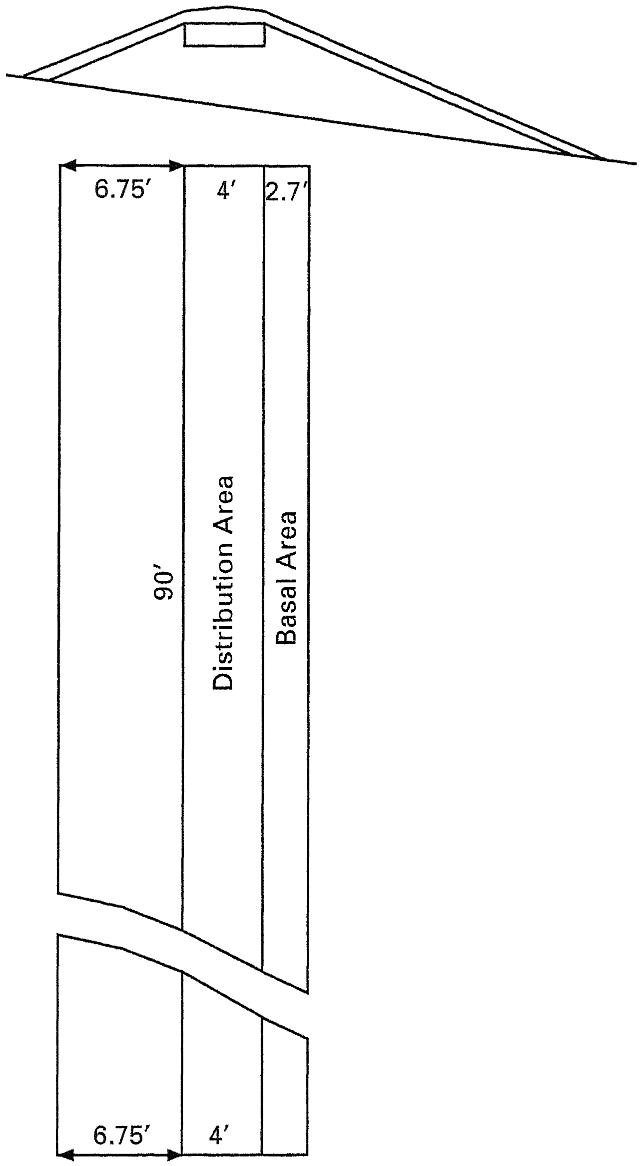
Step 12. Determine the Upslope Width.

The mound side slope should not be steeper than 3:1 (run:rise) for safe mowing. Therefore, the mound sand footprint will be extended in all directions outside the distribution area. The upslope width intersects the site slope and an upslope width correction factor is used for the width adjustment. The upslope width correction factor can be calculated as 1/[1+(Mound side slope factor, or run)*(Site slope)]. Upslope width correction factors are provided in Table 3 for a 3:1 mound side slope for various site slopes.

Upslope Width = (Mound side slope factor, or run)*(Mound sand fill upslope depth + Aggregate depth + Distribution protection depth)*(Upslope correction factor)

Table 3. Upslope Width Correction Factor for a 3:1 Mound Side Slope

Site Slope (run/rise)	Correction Factor
1	0.97
2	0.94
3	0.92
4	0.89
5	0.87
6	0.85
7	0.83
8	0.81
9	0.79
10	0.77
11	0.75
12	0.73
13	0.72
14	0.70
15	0.69



Upslope Width:

The recommended mound side slope is 3:1 in this design example and the corresponding upslope correction factor is 0.73.

Upslope Width = (Mound side slope factor)(Mound sand fill upslope depth + Aggregate depth + Distribution protection depth)*(Upslope correction factor)*

= (3)(22 inches + 9 inches + 6 inches)*(0.73)*
= 81 inches
= 6.75 ft

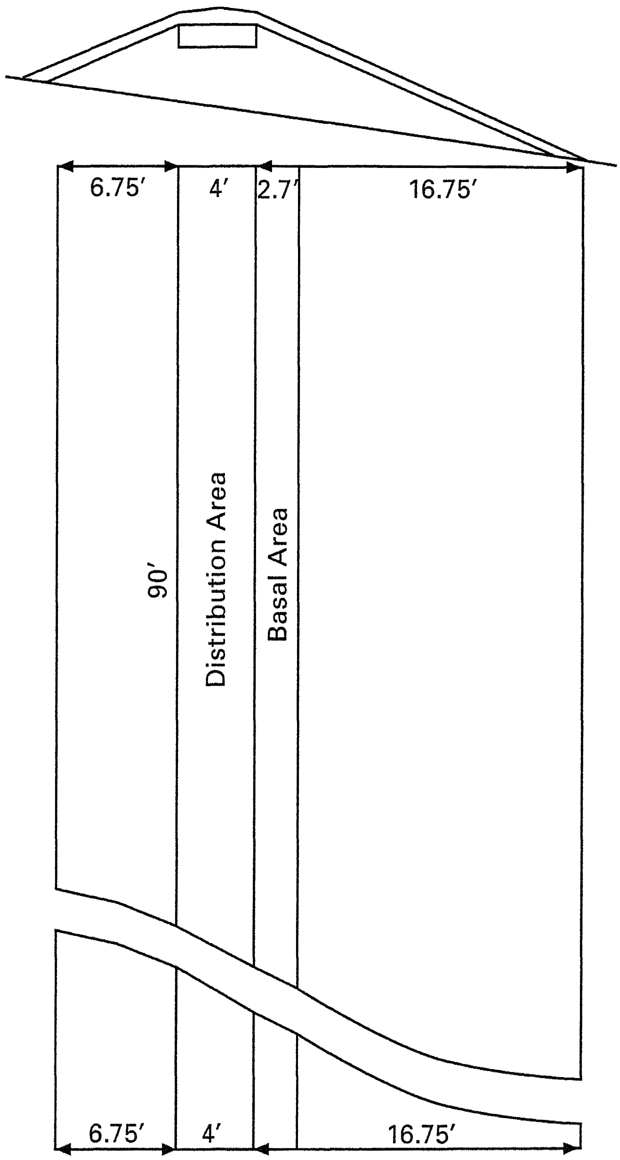
Step 13. Determine the Downslope Width.

The mound downslope side should also be no steeper than 3:1 (rise:run) for safe mowing. Since the site slopes away, a downslope width correction factor is required for the width adjustment. The downslope width correction factor can be calculated as 1/[1 – (Mound side slope factor, or run)*(Site slope)]. Downslope width correction factors are provided in Table 4 for a 3:1 mound side slope for various site slope. (Note: Downslope width normally is larger than basal width.)

Downslope Width = (Mound side slope factor, or run)*(Mound sand fill downslope depth + Aggregate depth + Distribution protection depth)*(Downslope width correction factor)

Table 4. Downslope Width Correction Factor for a 3:1 Mound Side Slope

Site Slope (run/rise)	Correction Factor
1	1.03
2	1.06
3	1.10
4	1.14
5	1.18
6	1.22
7	1.27
8	1.32
9	1.37
10	1.43
11	1.49
12	1.56
13	1.64
14	1.72
15	1.82



Downslope Width:

The recommended mound side slope is 3:1 in this design example and the corresponding downslope correction factor is 1.56.

Downslope Width = (Mound side slope factor)(Mound sand fill downslope depth + Aggregate depth + Distribution protection depth)*(Downslope width correction factor)*

= (3)(28 inches + 9 inches + 6 inches)*(1.56)*

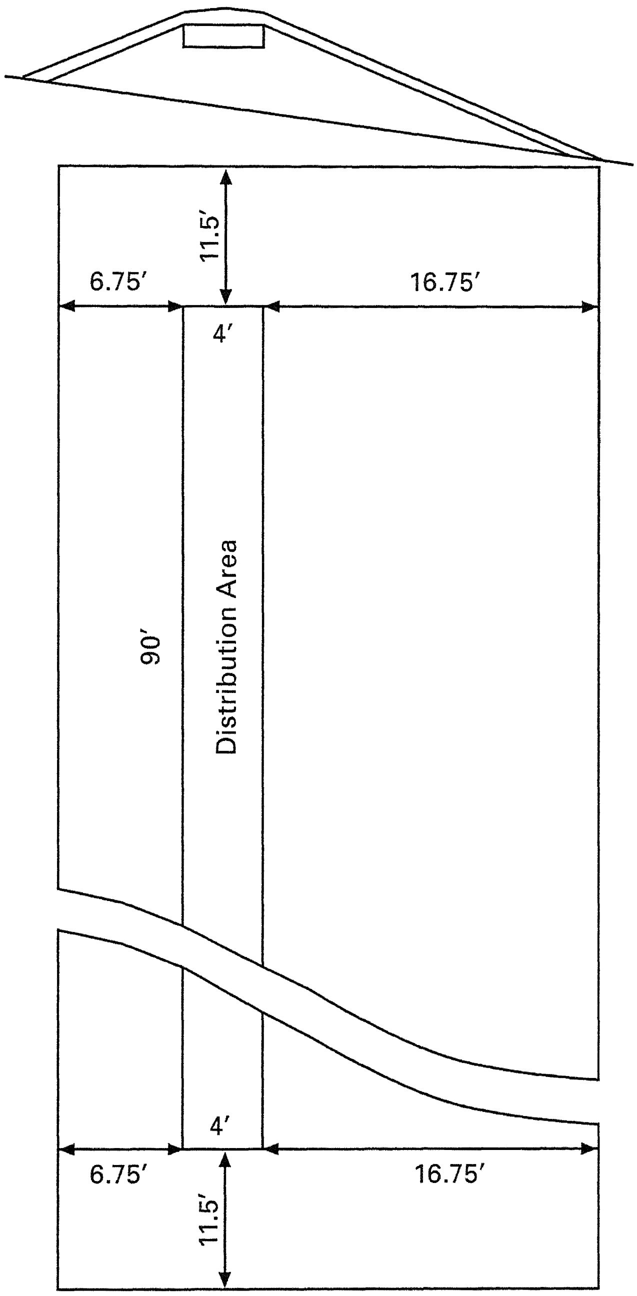
= 201 inches

= 16.75 ft

Step 14. Determine the End Slope Length.

The mound will slope off at both ends. By adding on the end slope length, the overall length of the finished mound can be outlined on the site. Be sure that design specifications require that all trees are removed from this location. If soil is mounded around the base of a tree it will die.

End Slope Length = (Mound side slope factor) * (Average depth of sand fill under absorption area + Aggregate depth + Distribution protection depth + Mound cap depth)



End Slope Length:

The recommended mound side slope is 3:1 in this design example.

*End Slope Length = (Mound side slope factor) * (Average depth of sand fill under absorption area + Aggregate depth + Distribution cover depth)*

= 3([22+28]/2 inches + 9 inches + 12 inches)*

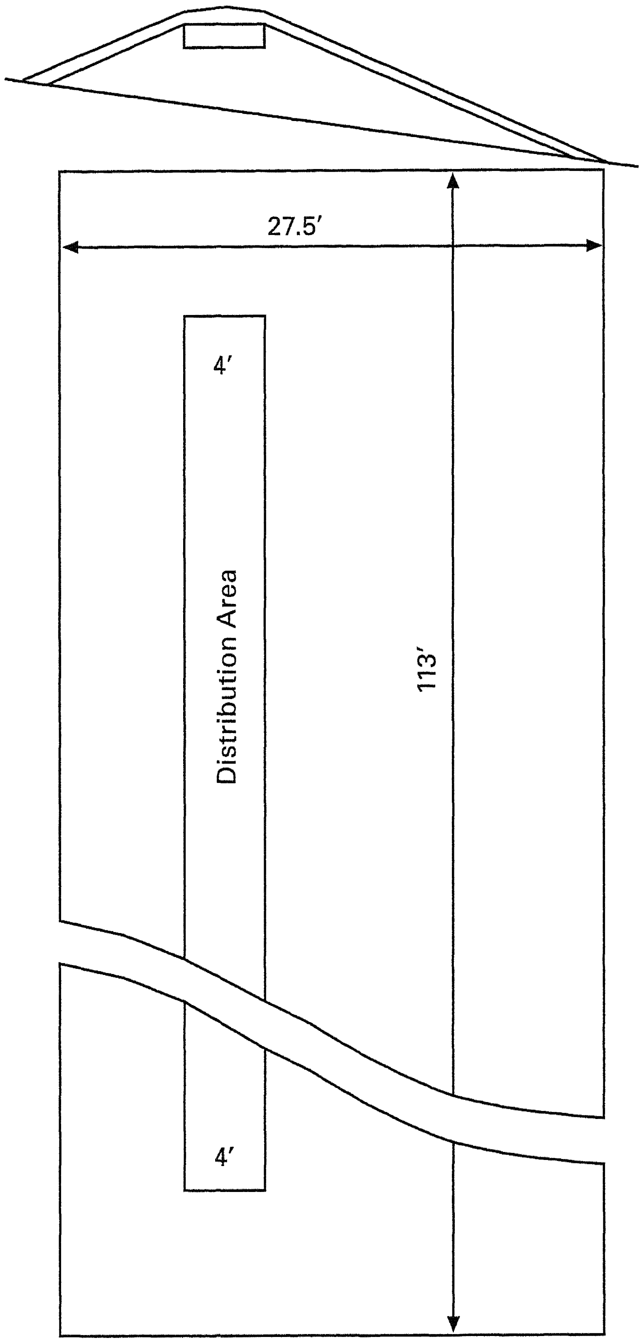
= 138 inches

= 11.5 ft

Step 15. Overall Mound System Length and Width.

Overall Length = (Distribution area length) + (2)*(End slope length)

Overall Width = (Distribution area width) + (Upslope width) + (Downslope width)



Overall Length and Width:

Overall Length = (Distribution area length) + (2)(End slope length)*
= (90 ft) + (2)(11.5 ft)*
= 113 ft

Overall Width = (Distribution area width) + (Upslope width) + (Downslope width)
= (4 ft) + (6.7 5 ft) + (16.75 ft)
= 27.5 ft

*The overall dimensions of this mound system (27.5 ft * 113 ft) fit within the proposed site area (50 ft * 160 ft).*

Distributing Septic Tank Effluent in Mound Systems

Septic tank effluent is distributed in the mound through a series of perforated pipes buried in a layer of gravel or a chamber above the sand fill. Uniform distribution of the septic tank effluent is important in mound systems. Uneven distribution of septic tank effluent can result in localized overloading, short-circuiting through the mound, and even breakout at the side slope or toe of the mound near the overload.

Uniform distribution is achieved using a pressure distribution system. Pressure distribution systems should be carefully designed so that the volume of septic tank effluent flowing out of each hole is uniform across the system. The pipe diameters and hole diameters must be carefully sized to achieve uniform distribution. A pump placed in a dosing tank is used to deliver the septic tank effluent into the mound and pressurizes the distribution network.

A pressure distribution network should be designed in accordance with Bulletin 829, *Mound Systems: Pressure Distribution of Wastewater—Design and Construction in Ohio.* This bulletin explains the dosing tank and distribution system that convey the septic tank effluent into the mound for treatment and disposal. The discussions on design and construction are intended to enable designers, contractors, and health officials to properly design, construct, and inspect pressure distribution systems for mounds.

Pressure distribution systems for mounds consist of five components:

1. lateral pipes with equally spaced holes and end turn ups to facilitate maintenance and monitoring of distal pressure;
2. the manifold and main connected to the laterals;
3. a dosing tank to accumulate septic tank effluent to be pumped to the mound;
4. a pump to pressurize the system;
5. controls and power supply to operate the pump.

Bulletin 829 is available for purchase through your local OSU Extension office. The bulletin can also be found at **www.ag.ohio-state.edu/~setll.**

How Should Mound Systems Be Constructed?

Because a large portion of the mound system components are above-grade, mound systems are easier to construct than conventional soil absorption systems. The most important things for a contractor to remember are outlined in the following eleven-step procedures.

Recommended Construction Procedures for Mound Systems

Step 1

Lay out the proposed mound system along the contour of the lot in the area specified by the detailed soil and site evaluation. According to the designs, outline and stake three areas: distribution area, basal area, and overall footprint of the mound.

Step 2

Determine the septic tank and dosing tank locations based on the site layout. The tanks should be installed to the side or upslope of the mound.

Step 3

Prepare the site for the mound. Mow the grass to a maximum 2-inch height and remove the cuttings from the mound location. Construction should be delayed if the soil is too wet. Dig a trench from the dosing tank to the side or upslope of the mound. The trench is for the pressure pipe bringing septic tank effluent into the center of the mound. The pressure pipe should be installed with an adequate slope so that the septic tank effluent drains back to the dosing tank after the pump shuts off. The trench should be adequately bedded and filled with granular backfill to reduce settling.

Step 4

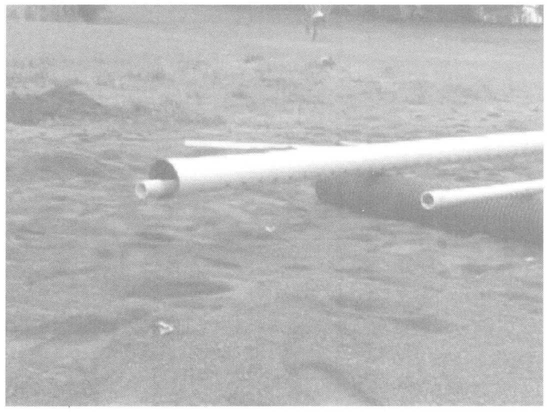
Prepare the soil surface in the basal area. A chisel plow on a small tractor or special teeth fitted to the backhoe bucket can be used to scarify the soil surface. Scarifying the soil surface and breaking up the sod growing in the basal area will improve the contact of the mound sand with the natural soil. Avoid any traffic and equipment on the basal area or downslope of the mound. The basal area will be covered with a layer of sand that protects the soil under the mound from compaction during construction.

Step 5

Bring in the mound sand to form the absorption area and cover the basal area. Two different methods can be used to bring in sand to shape the mound. The traditional approach uses a dump truck to deliver the sand to the upslope side of the mound. A backhoe moves the sand into the shape of the mound covering the entire basal area. The alternative method is to use a truck equipped with a conveyor to place the sand over the basal area to the appropriate depth. This approach is especially suited to limited access sites. Paint marks on the ground outlining the basal area and paint stakes indicating the desired depth of sand in the absorption area guide the conveyor operator in placing the sand to shape the mound.

Step 6

Level off the sand surface in the absorption area. Cut off the distribution main at least 4 inches above the sand surface and remove all bits of plastic and rough spots that can accumulate debris and clog the pipe. Place some sections of 6-inch pipes across the top of the sand to support the layout of the distribution pipes. Lay out the main, manifold, and laterals according to the designs. Cement all tees and joints to prevent leakages and pressure losses.



Step 7

The distribution orifices should be mechanically drilled at the shop and hand drilling is discouraged. Mark the hole positions evenly on the top of the laterals according to the design calculations. Drill 1/4-inch diameter holes with a sharp drill bit to help create clean holes and minimize rough edges. Drill 1/4-inch diameter drain holes in the bottom at the end of laterals. Slide a smaller diameter pipe back and forth inside the distribution pipes to knock off any pieces of plastic extending down from the drill holes. The distribution system is typically constructed with small diameter pipes with small holes spaced evenly along the top of the pipes. The pipe size, hole size, and hole spacing should be carefully calculated and linked. Consult with the designer before changes are made to make necessary adjustments during the construction.

Step 8

Install an observation port in the gravel down to the sand to serve as a window into the mound to check for ponding of wastewater on the sand surface. Three methods of stabilizing observation tubes are shown in Figure 4. Attach turn-ups to the end of each pipe with a removable cap to allow for flushing accumulated debris from the pipes. The turn-up is supported with gravel to accept the flushed wastewater and allow it to flow back into the mound for treatment. A valve box works well to house the turn-ups so they can be easily located and accessed for regular maintenance.

Step 9

Cover the distribution system with clean washed gravel. The holes on the top of the pipe need to be shielded so that they are not restricted by the gravel cover. A 4-inch perforated pipe slid over the distribution pipe makes an effective shield. Cover the gravel with construction fabric before placing the insulating layer of soil on top of the mound. As an alternative to gravel cover, chambers can also be used to cover the sand and distribution pipes if the design specifies.

Step 10

Cover the sand and gravel with an insulating layer of soil. Deliver soil cover material to the upslope side of the mound and cover the mound working from the upslope side. Never allow any heavy equipment on the area downslope of the mound. The treated wastewater flows downslope through the soil. Heavy equipment will result in unnecessary soil compaction and lead to bleed out at the toe or downslope of the mound. Properly grade the upslope side of the mound to divert surface runoff around the mound. Stay on the mound while shaping the downslope side to limit soil compaction. A small bulldozer works well to shape the mound. Seed the soil cover of the mound to limit soil erosion as soon as the construction is completed. If it is late in the season, additional erosion control measures may be necessary.

Step 11

Preparation of as-built drawings is encouraged for good record keeping. The as-built drawings should include actual mound system layout, elevations, benchmark, and start-up date. The drawings should be kept for personal records with copies provided to owner and inspector.

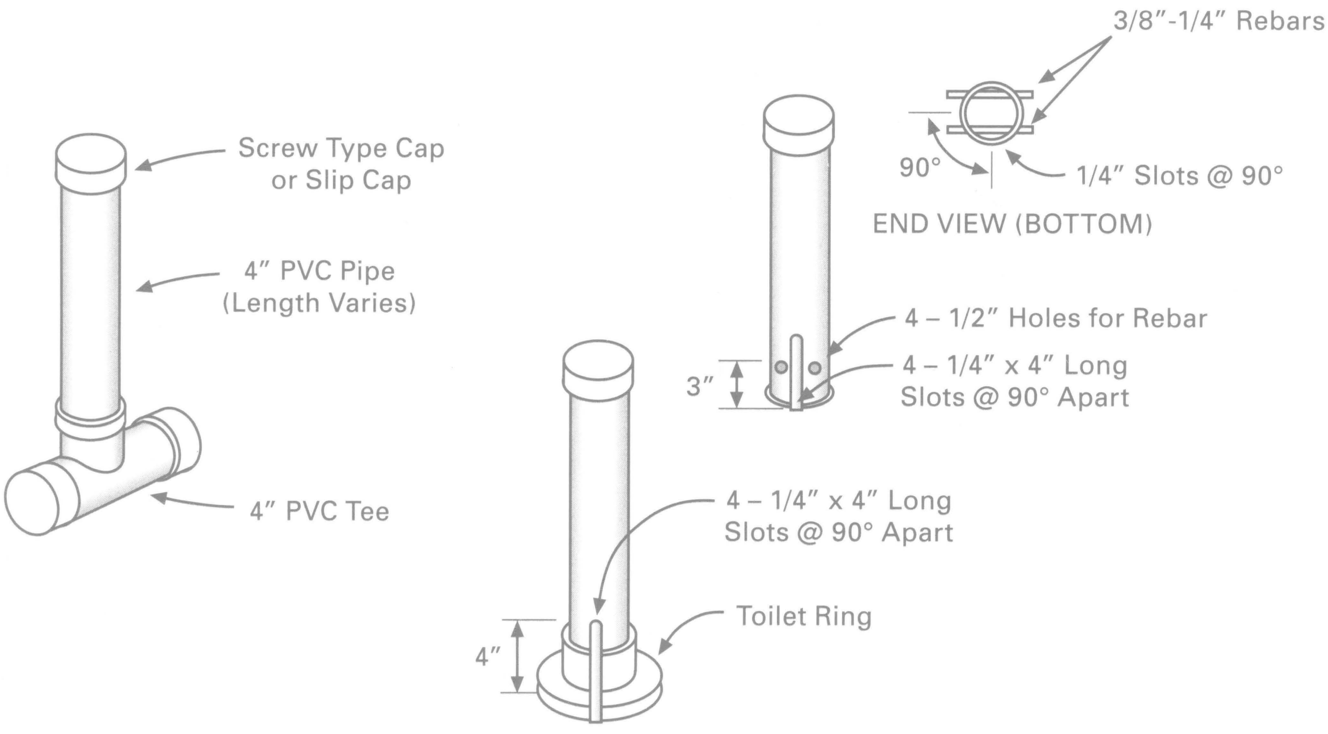


Figure 4. Three methods of stabilizing observation tubes. (After Converse and Tyler, 1990.)

How Are Mound Systems Maintained to Insure Decades of Trouble-Free Operation?

Maintenance-free wastewater treatment systems do not exist. All onsite wastewater treatment systems require at least annual inspection and maintenance. Because mound systems have mechanical pumps and small diameter laterals, residential systems require semi-annual inspection. Each inspection and maintenance takes a trained professional approximately 30 minutes to complete. For systems with great distances between pumps and the mound, it may take as long as one hour to complete the necessary inspection and maintenance.

Important inspection and maintenance steps include:

- Make sure no trees or shrubs are planted on the mound. Tree roots will clog the distribution pipes.
- Avoid sprinkler systems and irrigation on a mound. Plant ground-cover vegetation that can tolerate dry conditions, if necessary.
- Walk around the lot and look for landscape changes that can interfere with or damage the mound system.
- Walk downslope of the mound to check for signs of surfacing sewage.
- Locate and open up each inspection port to check for ponding.
- Activate the pump and check alarms.
- Open valve box at the end of each lateral to open and flush lines to remove debris that may clog holes in the small diameter pipes.
- Conduct a pressure test for each line and compare it to the initial test to check for plugging or broken pipes.

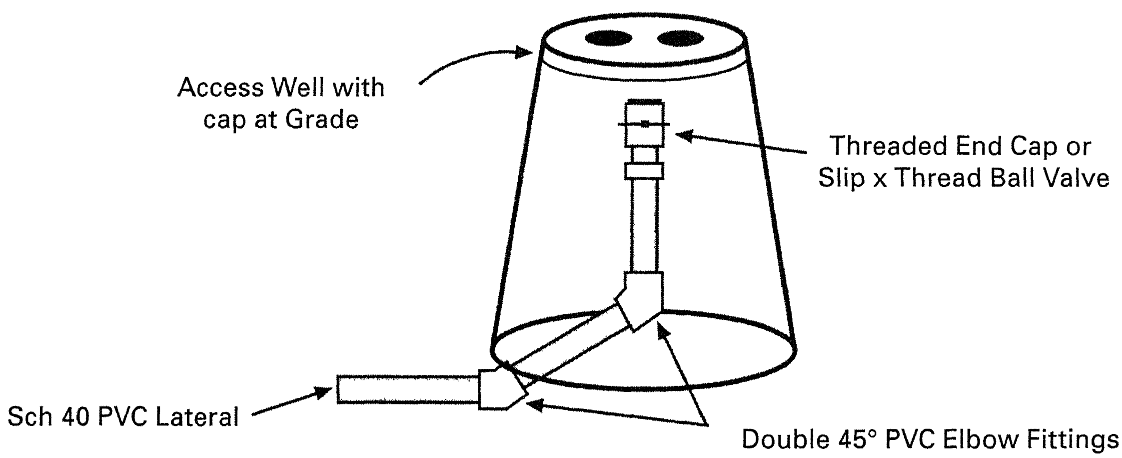


Figure 5. Valve to flush line at end of each lateral (not to scale)

Mound System Inspection and Maintenance Record

Owner____________________________________

Address ___________________________________

____

County

Permit No.		Site Plan
Permit Issued		
Date Installed		
Date Started		
Bedrooms		
Septic Tank Volume		
Dosing Tank Volume		
Baseline Pressure		
Septic Tank Pumped Dates		

Inspection Date			Inspector Name and Phone Number							
Landscape changed		Sign of surface ponding		Mound damaged		Pump functional		Level control/ Alarm functional		
yes	no	yes	no	yes	no	yes	no	yes	no	
Inspection		Port 4		Port 3		Port 2		Port 1		
Sign of ponding		no	yes	no	yes	no	yes	no	yes	
Pressure head			in/cm		in/cm		in/cm		in/cm	
Comments										

Inspection Date			Inspector Name and Phone Number							
Landscape changed		Sign of surface ponding		Mound damaged		Pump functional		Level control/ Alarm functional		
yes	no	yes	no	yes	no	yes	no	yes	no	
Inspection		Port 4		Port 3		Port 2		Port 1		
Sign of ponding		no	yes	no	yes	no	yes	no	yes	
Pressure head			in/cm		in/cm		in/cm		in/cm	
Comments										

Inspection Date			Inspector Name and Phone Number						
Landscape changed		Sign of surface ponding		Mound damaged		Pump functional		Level control/ Alarm functional	
yes	no	yes	no	yes	no	yes	no	yes	no
Inspection		Port 4		Port 3		Port 2		Port 1	
Sign of ponding		no	yes	no	yes	no	yes	no	yes
Pressure head			in/cm		in/cm		in/cm		in/cm
Comments									

Inspection Date			Inspector Name and Phone Number						
Landscape changed		Sign of surface ponding		Mound damaged		Pump functional		Level control/ Alarm functional	
yes	no	yes	no	yes	no	yes	no	yes	no
Inspection		Port 4		Port 3		Port 2		Port 1	
Sign of ponding		no	yes	no	yes	no	yes	no	yes
Pressure head			in/cm		in/cm		in/cm		in/cm
Comments									

Inspection Date			Inspector Name and Phone Number						
Landscape changed		Sign of surface ponding		Mound damaged		Pump functional		Level control/ Alarm functional	
yes	no	yes	no	yes	no	yes	no	yes	no
Inspection		Port 4		Port 3		Port 2		Port 1	
Sign of ponding		no	yes	no	yes	no	yes	no	yes
Pressure head			in/cm		in/cm		in/cm		in/cm
Comments									

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